AN ANNOTATED KEY TO THE NEW ZEALAND ODONATA

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ABSTRACT

An illustrated key is presented to adults of all species of Odonata recorded from the New Zealand region except members of the genus *Xanthocnemis* which are currently under revision. Comments are made on nomenclature. *Uropetala chiltoni* Tillyard is reinstated as a species distinct from *Uropetala carovei* (White).

INTRODUCTION

Keys to the adults of New Zealand Odonata have been produced previously by Fraser (1960) and Penniket (1966) while larval keys have been provided by Penniket (1966) and Rowe (1981a). The Fraser and Penniket keys have proved confusing when used by advanced entomology students with much material to hand. The keys to Odonata families in the commonly used texts Borror, Delong and Triplehorn (1976) and C.S.I.R.O. (O'Farrell, 1973) are unwieldy for use with New Zealand's limited fauna.

The following key is based on a trial key prepared and circulated to secondary schools as part of a faunal distribution survey in 1979 and also used in 3rd year entomology laboratories at the University of Canterbury.

NOMENCLATURE

The nomenclature used in this key differs from that of the most recent checklist of the N.Z. fauna (Wise 1977). The reasons for changes are as follows:

Coenagrionidae: The genus *Xanthocnemis* contains at least four valid species, only one of which *(X. zealandica* (McLachlan)) has been recognised in recent checklists. Revision of this genus is in progress. The venation (Tillyard, 1912) and cytogenetics (Jensen, 1980) of *X. zealandica* (and venation of the other species) do not appear consistent with the Pseudagrioninae and its placement there is open to question, a change has not been made.

Petaluridae: The Wise checklist follows Wolfe (1953) rather than Fraser (1960) in recognising only one species of *Uropetala*. Recent work on cytogenetics (Jensen and Mahanty, 1978), emergence behaviour (Winstanley *et al.*, 1981) and ecology (pers.obs.) indicate that Wolfe's work is in need of serious reevaluation. A review of institutional collections (Winstanley and Rowe, 1980) and subsequent material indicate that Wolfe, by regarding all South Island specimens as *U. "chiltoni"*, confused populations of *carovei* and *chiltoni*. Tillyard (1921) recorded the occurrence of *carovei* in collections from L. Wakatipu and rejected Cook Strait as a geographic isolating feature. Wolfe's synonymizing of the species was equivocal (e.g. p.246 "study of the life history and ecology of *Uropetala chiltoni* Tillyard. The present paper is the result of one year's study of the southern species and nine months' general survey of the genus throughout New Zealand and comparison of the southern species with the northern species *Uropetala carovei* White." and p.270 "I suggest naming the North Island form *Uropetala carovei carovei* and the southern imagos *Uropetala carovei chiltoni.")* and appears to be due to a misinterpretation of the specimens he examined. My own collections from two areas where the species distributions are contiguous (Umbrella Ra., Central Otago; Otira-Turiwhate, Westland) indicate that while hybridization can occur it is restricted to a narrow zone and *carovei* and *chiltoni* are good biological species in the sense of Mayr (1963). They are so treated here. Palaeobotanical evidence of severe, sustained reductions in *chiltoni* habitat, to areas of the same order as the cruise range of *Uropetala* males, during parts of the Quaternary (e.g. McGlone, 1981) provide strong circumstantial evidence for the existence of some effective biological barrier between *U. carovei* and *U. chiltoni*. The long generation time of the species (ca 6 years) (Martin, 1929; Wolfe, 1953) makes direct testing of biological barriers impracticable. The minor phenotypic markers which distinguish the imagos of the species (Table 1) are unlikely to have any significance as isolating mechanisms. There are minor differences in the male accessory genitalia which might have some function in isolating the species (the figure in Wolfe, 1953 is not an

adequate representation). It is probable that species isolation occurs either through oviposition site selection and larval physiological adaptation to distinctly different habitats (Turbott, 1949; Wolfe, 1953; Winstanley and Rowe, 1980) or reduced hybrid fertility. (For consideration of interspecific mating in sympatric species see Parker 1974).

TABLE 1

feature	carovei	chiltoni
yellow spots on labrum	absent	large, prominent
yellow patches on abdomen (patches smaller in females)	typically widely separated (especially obvious on segment IV)	almost touch on segment IV
male superior appendages	typically broadly rounded	typically somewhat triangular (but not as exaggerated as in Fraser, 1960)
end tooth on male inferior appendage	apical	subapical

Aeshnidae: During the 1930s liberations of larval *Austroaeshna parvistigma* Martin were made at two localities in the South Island (Cass, mid Canterbury; Maitai R., Nelson); releases may also have been made in Christchurch (Anon, 1931). So far as can be determined no adults were ever collected and the species did not become established. In the key presented here it would go to Aeshnidae. The species is dark brown-black with light green (not yellowish) markings. The veins IR_3 and Rspl are separated by a single row of cells.

Corduliidae: A revision of the Pacific Corduliidae is currently being carried out by M.A. Lieftinck (Lieftinck, 1980). Some points need to be made: The generic position of *"Procordulia" grayi* (Selys) is open to query on several grounds; venation (Selys, 1871; Walker, 1925; Fraser, 1960), cytotaxonomy (Jensen, 1980), egg morphology (Armstrong, 1958; Winstanley, 1981; Rowe, 1981b) and larval characters (Watson, 1979). It was placed in *Procordulia* Martin, 1906 by Tillyard (1920) through the simple expedient of listing it "the most frequently occurring being those of *Procordulia smithii, Pr. grayi* and *Xanthocnemis zelandica* (sic), "without further explanation. In contrast, in a major revision, Martin (1914) left *grayi* in *Somatochlora* Selys while transferring *smithii* to *Procordulia*. Walker (1925) rejected the

placement in *Somatochlora* but offered no alternative. Like *Antipodochlora braueri, grayi* may require its own monotypic genus. *Procordulia smithii* (White) contains a number of phenotypically distinct local and seasonal varieties. The Chatham Islands form may deserve sub-specific status if the shape of the male hamules is stressed, but collections are few. Watson (1979) has expressed doubt about the identity of the species known in New Zealand as *Hemicordulia australiae* (Rambur) but clarification must await a reworking of the Australian fauna. Lieftinck (1953) illustrated geographical differences in female structures within *H. australiae*. Contrary to Allbrook's (1979) assertion, no records of *Hemicordulia tau* are known from New Zealand.

Libellulidae: The occurrence of *Pantala flavescens* (Fabr.) and *Tramea transmarina* Brauer in the New Zealand region has been discussed by Rowe (1980) and the affinities of Raoul Island *T. transmarina* have been discussed in Armstrong (1973). The number of cell rows in the discoidal field of the wing used by Fraser (1960) to separate Sympetrinae (e.g. *Diplacodes)* and Pantaliinae *(Pantala* and *Tramea)* are not effective with New Zealand specimens. Some New Zealand specimens of *Diplacodes bipunctata* have been described as the subspecies *D.b. novae-zealandiae* (McLachlan). The subspecies differs principally in having larger yellow areas on the wings (and perhaps minor differences in male genitalia) and especially as specimens corresponding to both the typical form and *novae-zealandiae* are known from New Zealand, its status is uncertain.

Key to the adults of New Zealand dragonflies (each couplet is illustrated).

1. Fore and hind wings similar in shape (Fig.1a); petiolate (narrow at base); ♂ with pair of superior appendages and a pair of inferior appendages situated below the anus; ♀ with ovipositor.....
sub order Zygoptera 2

   Fore and hind wings different in shape (Fig.1b); hind-wings with broad base; ♂ with pair of superior appendages and a single inferior appendage situated above the anus;

   ♀ with or without an ovipositor.....
sub order Anisoptera..... 4

2. Pterostigma ca 3x as long as deep, costal and hind margins of pterostigma subequal (Fig.1c); length of body ca 45mm; body blackish: male with blue markings, female with greenish markings. Lestidae... *Austrolestes colensonis* (White)

   Pterostigma lozenge shaped, approximately as long as deep, costal and distal margin subequal, costal margin much longer than hind margin (Fig.1d).... Coenagrionidae... 3

3. ♂ red-orange with segs VIII and IX blue dorsally (Fig.1e); ♀ bronze, with vulvar spine (Fig.1f); yellowish line on mesepisternum narrow, straight (Fig.1g)... *Ischnura aurora* Brauer

♂ red; ♀ red or bronze, without vulvar spine, yellowish line on mesepisternum broad and with distinct notch on lateral border (Fig.1h)..... *Xanthocnemis*

4. Eyes widely separated at top of head (ca 2mm) (Fig.1i) .....Petaluridae 5

Eyes at least touching at top of head (Fig.1j).....6

5. Labrum (Fig.1k) unicolorous black (Fig.1l); ♂ superior appendages broadly rounded; North Island, Marlborough, Nelson, Westland, Southland..... *Uropetala carovei* (White)

Labrum (Fig.1k) with a pair of yellow patches (Fig.1m); ♂ superior appendages somewhat triangular (but not as exaggerated as depicted in Fraser (1960); Kaikoura Ra to Central Otago.....*Uropetala chiltoni* Tillyard

6. Triangle in forewing ca 2x longer than deep (Fig.2a) ..... Aeshnidae 7

Triangle in forewing narrower than deep (Fig.1b).....8

7. Body dark with two strong yellow diagonal lines on the sides of the thorax (Fig.2b)..... *Aeshna brevistyla* Rambur

Costa yellow; thorax grey with green marbling .....*Hemianax papuensis* (Burmeister)

8. Lateral margin of eye emarginate (Fig.2c) (best viewed from a slightly posterior angle); anal loop with weak, broad toe ending some distance from the hind margin of the wing (Fig.1b, 2d, 2f); thorax metallic green dorsally .....Corduliidae.....9

Anal loop with pronounced toe almost reaching hind margin of wing (Fig.2e); lateral margin of eye not emarginate; thorax not metallic, colour yellowish, orange or reddish .....Libellulidae.....12

9. Arculus of hindwing opposite or outside second antenodal (Fig.2f); abdomen with fawn to brown lateral markings as in Fig.2g..... *Antipodochlora braueri* (Selys)

Arculus of hindwing midway between first and second antenodal (Figs.1b, 2d).....10

10. Thorax dark metallic green laterally; with no yellow spot present..... *Procordulia smithii* (White)

Thorax with a prominent, non metallic yellow splash above base of meso or metacoxa (Fig.2h).....11

11. Abdomen with fawn lateral markings but no yellow spots (Fig.2i); male appendages with interior spur .....*Hemicordulia "australiae"* (Rambur)

Abdominal segments with a pair of large yellow-orange rounded spots at the anterior end and no lateral markings (Fig.2j)..... *"Procordulia" grayi* (Selys)

12. Length of head + body 28-34mm. Base of hindwing "normal" (Fig.2e). Wing length and abdominal length (excluding appendages) subequal..... *Diplacodes bipunctata* (Brauer)

Length of head + body greater than 40mm. Base of hindwing very deep giving hindwing a somewhat triangular appearance (Figs.2k, 2*l*). Wing length approximately 30% greater than abdominal length (excluding appendages).....13

13. Vein R3 undulating; base of wings hyaline (Fig.2k) ..... *Pantala flavescens* (Fabr.)

Vein R3 smoothly curved; base of hindwing (usually) with conspicuous, often very large, dark brown patches (Fig.2*l*)..... *Tramea transmarina* Brauer

Material illustrated

Couplet 1: wings of Odonata; Fig.1a Zygoptera *(Austrolestes colensonis)*
Fig.1b Anisoptera *(Hemicordulia australiae)* (Ax = antenodal veins; arc = arculus; T = triangle; al = anal loop).

Couplet 2: pterostigmata of Zygoptera;
Fig.1c Lestidae *(Austrolestes colensonis)*
Fig.1d Coenagrionidae *(Xanthocnemis)*

Couplet 3: Coenagrionidae; Fig.1e Abd. tip ♂ *Ischnura aurora*
Fig.1f " " ♀ " "
(vulvar spine arrowed)
Fig.1g dorsal view of thorax *Ischnura aurora*
Fig.1h dorsal view of thorax *Xanthocnemis*

Couplet 4: eyes of Anisoptera; Fig.1i Petaluridae *(Uropetala chiltoni)*
Fig.1j other Anisoptera *(Procordulia smithii)*

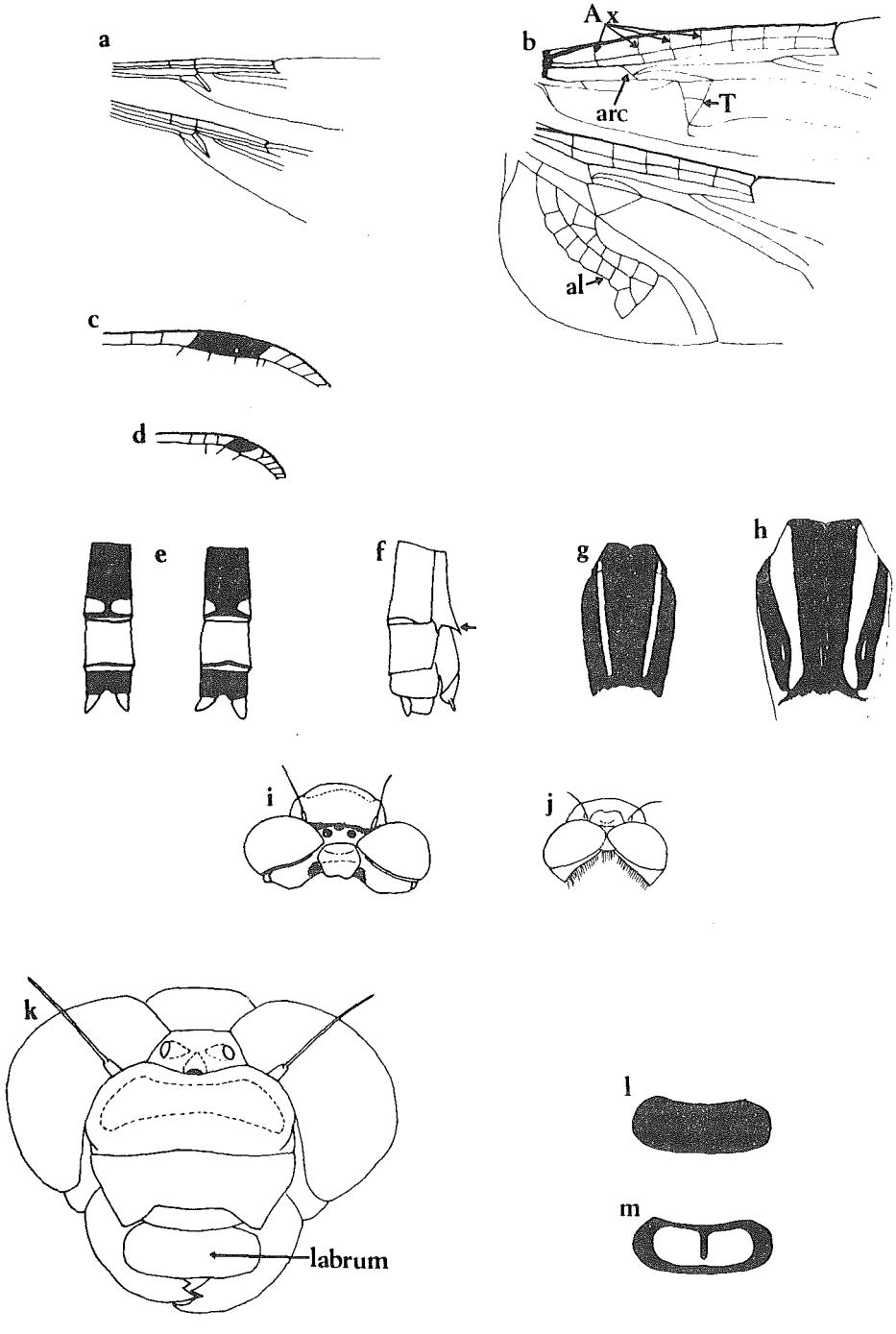

Fig. 1.

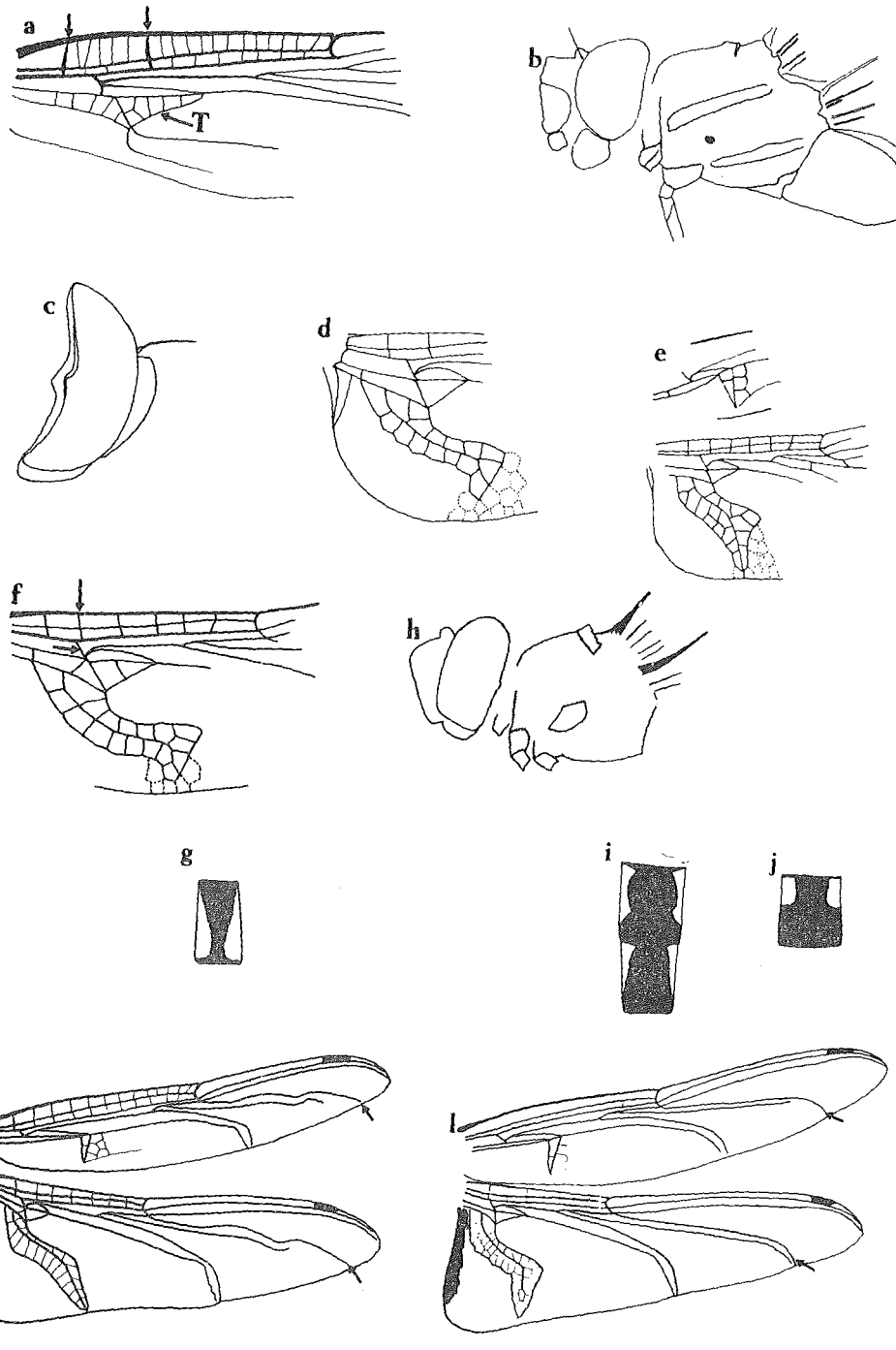

Fig. 2.

Couplet 5: face of Petaluridae;
Fig.1k Face (labrum arrowed) *(Uropetala carovei)*
Fig.1l labrum *Uropetala carovei*
Fig. 1m labrum *Uropetala chiltoni*

Couplet 6: forewings of Anisoptera;
Fig.2a Aeshnidae *Aeshna brevistyla* (triangle arrowed) (heavy primary antenodals (arrowed) are also characteristic of Aeshnidae) c.f. Fig.1b.

Couplet 7: Aeshnidae;
Fig.2b lateral view of thorax of *Aeshna brevistyla* showing position of yellow diagonal lines.

Couplet 8: Libelluloidea;
Fig.2c lateral emargination on eye of Corduliidae *(Procordulia smithii,* from slightly posterior angle).
Fig.2d anal loop of Corduliidae *(Hemicordulia australiae)* (See also Fig.2f.)
Fig.2e anal loop of Libellulidae *(Diplacodes bipunctata)*

Couplet 9: Corduliidae;
Fig.2f hindwing of *Antipodochlora braueri* (arculus and 2nd antenodal arrowed; c.f. Fig.2d)
Fig.2g dorsal view of abdominal segment VI *Antipodochlora braueri*

Couplet 10: Corduliidae;
Fig.2h lateral view of thorax of *"Procordulia" grayi* showing position of yellow patch.

Couplet 11: Corduliidae;
Fig.2i dorsal view of abdominal segments VI and VII *Hemicordulia australiae*

Fig.2j dorsal view of abdominal segment VI *"Procordulia" grayi* (in the broader ♀ abdomen the spots are more rounded)

Couplet 12: Libellulidae;
c.f. Figs.2e *(Diplacodes bipunctata)* 2k *(Pantala flavescens)* 2l *(Tramea transmarina)*

Couplet 13: Pantalini; Fig.2k wing of *Pantala flavescens* (R3 arrowed)
Fig.2l wing of *Tramea transmarina* (R3 arrowed)

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